The background features a large, light blue spiral graphic on the right side and a dark teal semi-circle on the left side.

Including Education and Outreach in Your Proposal:

How to Make It Meaningful and Make It Happen

Cynthia Hagley, Minnesota Sea Grant
Rochelle Sturtevant, Great Lakes
Environmental Research Laboratory

It's a "Sticky Wicket"*



- Funders looking for “broader impacts” of research, and...
- Scientists being asked to participate in education reform, but....
- Outreach and education activities still seldom rewarded in tenure or graduate student development process

*A wicket is, of course, the playing surface used in cricket. This phrase is a direct allusion to the difficulty of playing on a wet and sticky pitch.

<http://www.phrases.org.uk/meanings/334550.html>

Barriers to Outreach*

Graduate Students

- Lack of time
- Lack of information about outreach opportunities
- Lack of support from advisor or department

Faculty

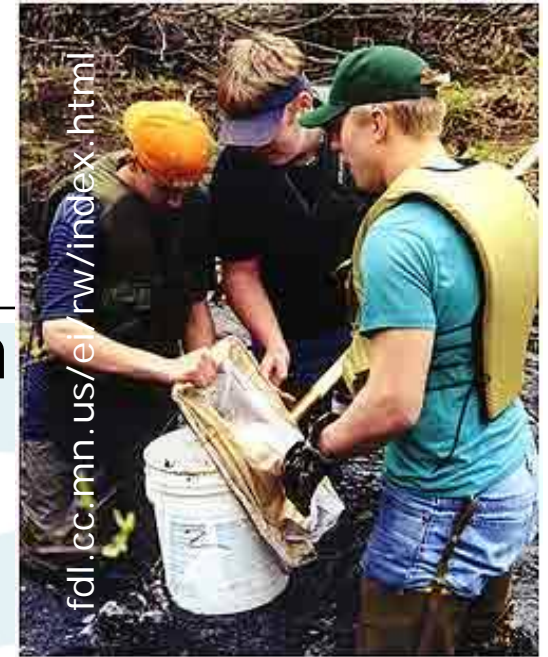
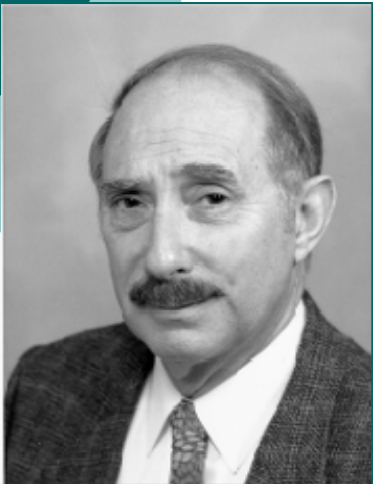
- Lack of time
- Lack of information about outreach opportunities
- Lack of value to department

* Andrews, E., A. Weaver, D. Hanley, J. Shamatha, and G. Melton. 2005. *Scientists and Public Outreach: Participation, Motivations, and Impediments*. Journal of Geoscience Education 53(3):281-293.

Faculty Outreach*

○ Most likely to do outreach if:

- Already had tenure
- Committed to volunteering in their community
- Had young kids in school
- Been approached by colleague or outreach liaison



* Andrews et al. 2005

Why Outreach?*

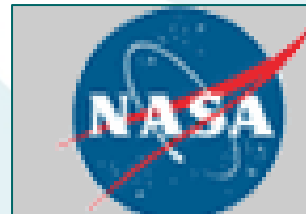
- Desire to contribute
- Responsibility for betterment of society
 - Correct public misconceptions
- Increase teacher and student science literacy
- Gain insights into public attitudes and perceptions



* Andrews et al. 2005

More* Reasons to Do Outreach

- Attract new scientists
- Improve teaching/communication skills
- Have fun
- Public support for science funding
- Stay in business – funders want it



*Pragmatic

Types of Scientist Outreach*

- Presentations (almost 50%)
- Tutoring
- Science fairs
- Act as resource for teachers
- Help with professional development

*Andrews et al. 2005



http://www.maharishischooliowa.org/images/ph_5_science_top.jpg

IAGLR Survey*

- ~60% of respondents have done presentation at K-12 level
- <30% have worked closely with an educational partner

* Chankook Kim, Ohio State University and others

What are Funders Looking For?



NSF – **broader impacts** resulting from activity and help **reform** science and math **education**



NASA – “significant emphasis on delivering the **benefit** of research endeavors **to public audiences**”



EPA – results disseminated broadly to enhance scientific and technological understanding; **benefits to society**



Merit Review Broader Impacts Criterion: Representative Activities

Proposals submitted to the National Science Foundation are evaluated through use of two merit review criteria, which all proposals must address explicitly. Experience shows that while most proposers have little difficulty responding to the criterion relating to intellectual merit, many proposers have difficulty understanding how to frame the broader impacts of the activities they propose to undertake.

The examples provided below are organized by the set of potential considerations used in assessing the broader impacts of the proposed activity. They illustrate activities that, when successfully incorporated in a project description, will help reviewers and NSF understand the broader impacts criterion in the review and decision process.

The list is not intended to be exhaustive, nor is any particular example relevant to all proposals. Proposers are encouraged to be creative in their descriptions of activities that they propose already undertaking or that they plan to undertake. Proposers already undertaking similar kinds of activities should carefully consider how to link these examples to the research and education projects they are proposing for funding. The list also includes examples that address the interests, while the broader impacts of the proposed activity.

The components of the broader impacts criterion as defined by the National Science Foundation are listed below. Each component is followed by a list of questions that

Broader Impacts Criterion: What are the broader impacts of the proposed activity?

How does the activity advance education, training, and learning while promoting teaching, training and learning?

- How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships?
- Will the activity enhance the technical and technological skills of students, teachers, and/or other research and education personnel?
- What may be the benefits of the proposed activity to society?

How does the activity enhance the research and education user facilities, ... research and education personnel?

Examples of Activities

- Identify and establish collaborations between disciplines and institutions within the U.S. academic institutions, industry and government and with partners.
- Stimulate and support the development and dissemination of new instrumentation, multi-user facilities, and other shared research platforms.
- Maintain, operate and modernize shared research and education

"Broader Impacts"

- Advance discovery and understanding while promoting teaching, training and learning
- Include students (K-graduate) as participants in your proposed activities....
- Participate in the recruitment, training, and/or professional development of K-12 science and math teachers.

learning with the excitement of discovery and understanding the findings and methods of research are quickly and effectively communicated to a broad and larger audience" (NSF GPRA Strategic Plan 2001-2006).

Examples of Activities:

- Integrate research activities into the teaching of science, math and engineering at all educational levels (e.g., K-12, undergraduate science majors, non-science majors, and graduate students).
- Include students (e.g., K-12, undergraduate science majors, non-science majors, and/or graduate students) as participants in the proposed activity as appropriate.
- Participate in the recruitment, training, and/or professional development of K-12 science and math teachers.
- Develop research-based educational materials (e.g., K-16 digital library).
- Partner with researchers and educators to develop effective means of incorporating research into learning and education.
- Encourage student participation at meetings and activities of professional societies.
- Establish special mentoring programs for pre-school students, undergraduates, graduate students, and technicians conducting research.
- Involve graduate and post-doctoral researchers in undergraduate teaching.
- Develop, adopt, adapt or disseminate effective research-based programs to science, mathematics and engineering teaching.

Broaden Participation of Underrepresented Groups

Background:

One of NSF's five-year strategies is to "broaden participation" in NSF programs. At present, several groups, including minority scientists and women, certain types of academic institutions, and some geographic areas are less than full participants in the science and engineering enterprise. NSF is committed to leading the way to an enterprise that fully captures the strength of America's

“Broader Impacts”

- Broaden Participation of Underrepresented Groups
 - Participate in **developing new approaches** to **engage underserved** individuals, groups, and communities in science and engineering.

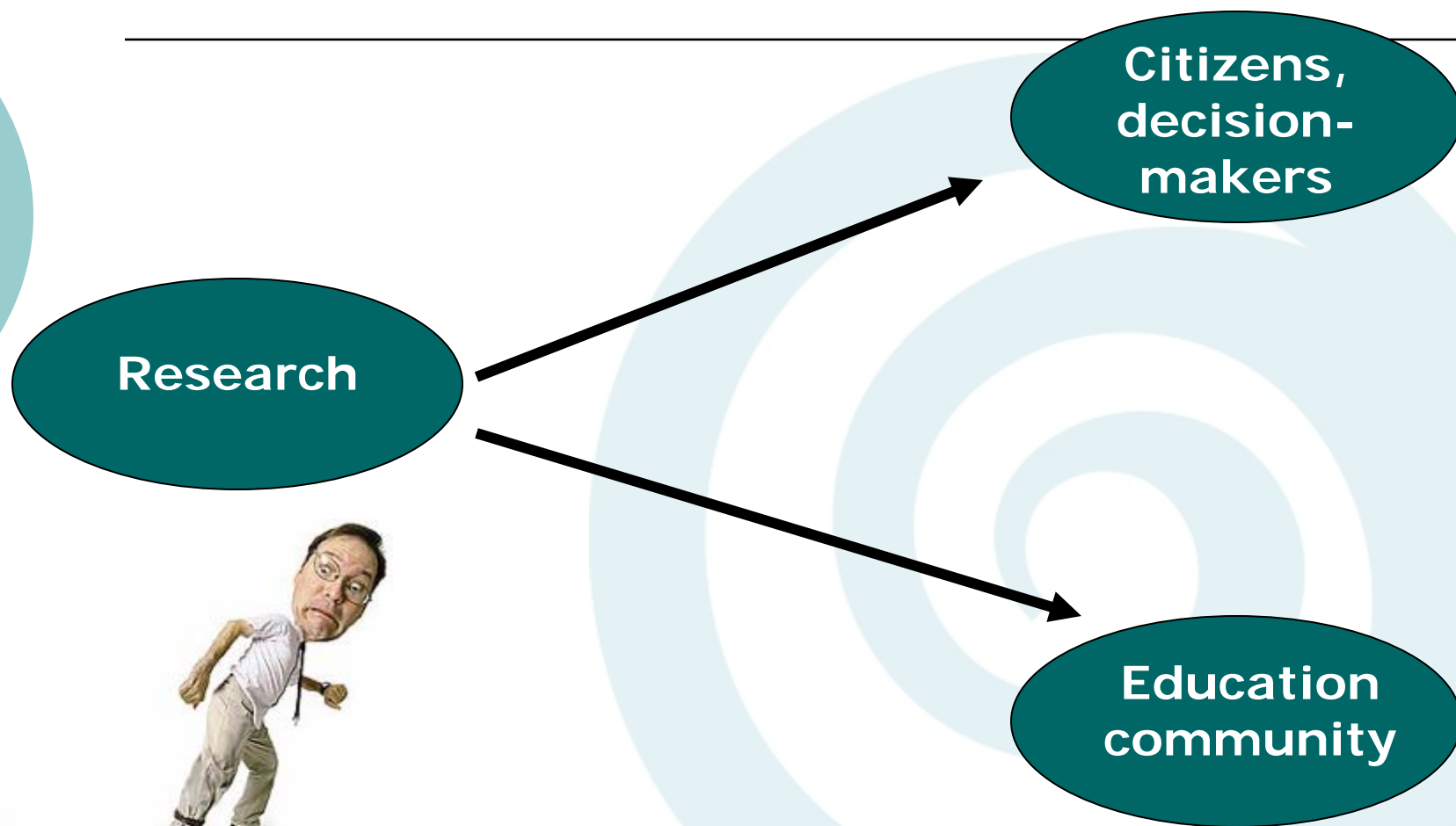
“Broader Impacts”

- Broad dissemination to enhance scientific and technological understanding
 - **Partner** with museums, nature centers, etc. to **develop exhibits.**
 - Publish in **diverse media** to reach **broad audiences.**
 - Present results in formats useful **to policy-makers, members of Congress, industry, broad audiences.**

“Broader Impacts”

- Benefits to Society
 - Demonstrate the linkage between discovery and **societal benefit** by providing specific examples and explanations....
 - Analyze, interpret, and synthesize **results** in formats **understandable and useful for non-scientists**.
 - Provide information for **policy formulation** by Federal, State or local agencies.

Connections



http://www.worldslaves.citymax.com/i/Ball-n-chain-guy_Rubberball.jpg

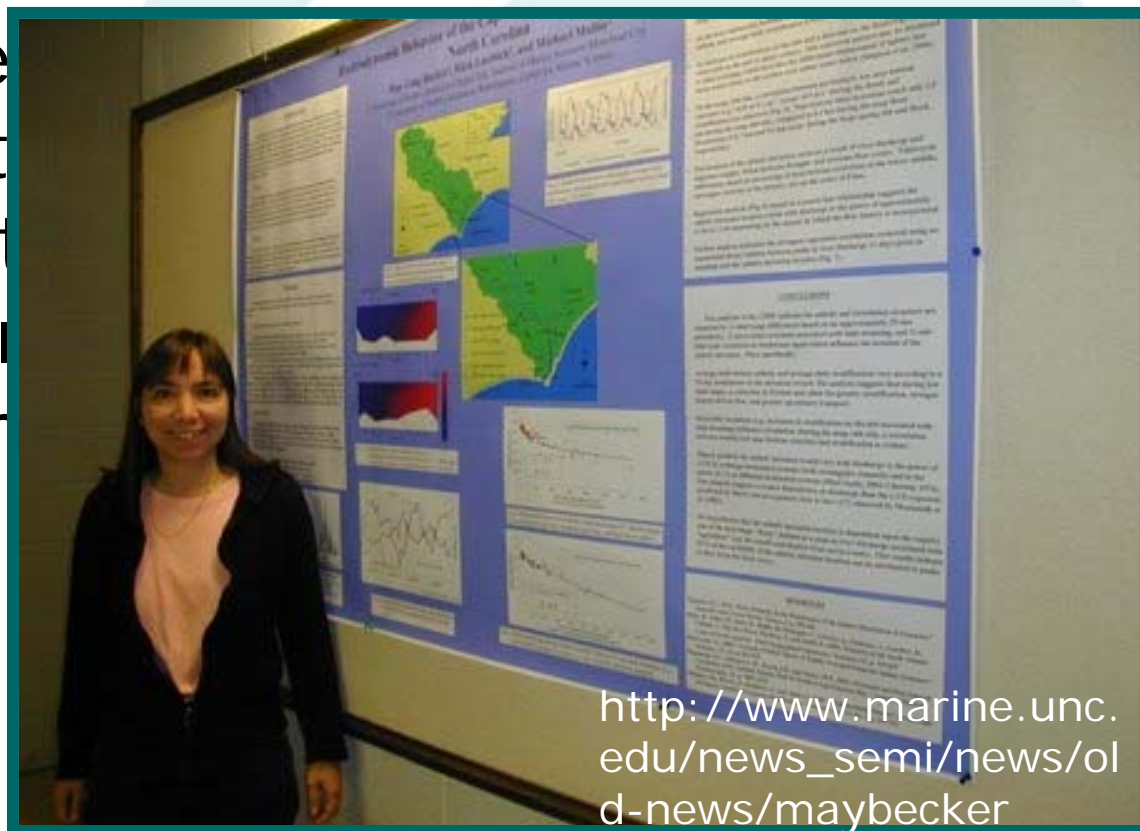
Overview

- How do you design the outreach component?
- How can you find outreach or education partners?
- How do you budget for it?
- Examples that work

What We've Often Seen

- Graduate student outreach =

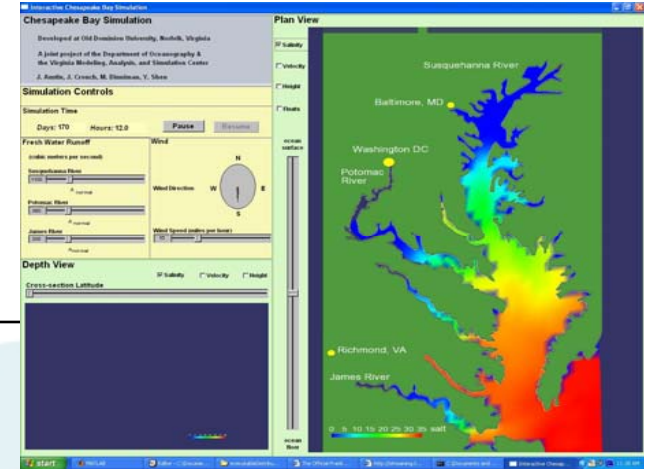
- We ask re to contact appropriate Grant out person wh preparing proposals



http://www.marine.unc.edu/news_semi/news/old-news/maybecker

For Example...

- Austin et al. –
Adapting numerical circulation
modeling tools for classroom use
 - Research-quality numerical
circulation model for Lake Superior,
Chesapeake Bay, etc.
 - Classroom instructional materials
 - Developed in cooperation with
teachers

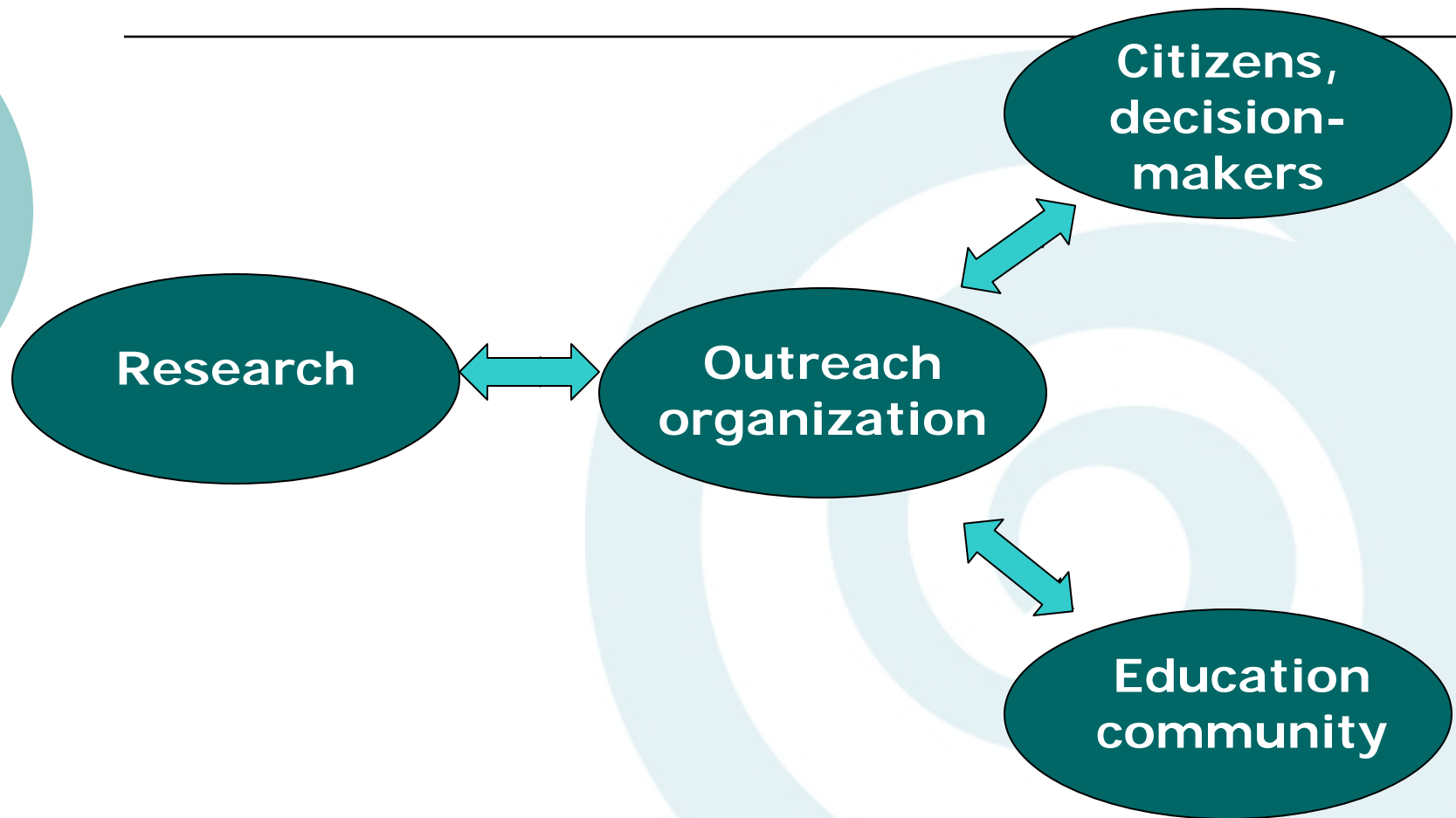


Strategies for Success

- Scientists more willing to do outreach* if:
 - Administrative aspects of outreach are coordinated by others
 - Activities and time commitments are clearly defined
 - Scheduling is flexible

*Andrews, et al. 2005; Waldman, A., L. Schechinger, and J. Nowick. 1996. A coordinated chemistry outreach program for thousands of high school students. J. of Chemical Education (73):762-764; O'Neil, D. and L. Gomez. 1996. Online mentors: experimenting in science class. Educational Leadership (54):39-42.

Connections



The Good News.....

- We're here to help
 - COSEE
 - Sea Grant outreach/communication staff
 - State NOAA coastal programs
 - Museum and aquarium staff
 - Curriculum directors
 - State and local natural resource management agencies

“Ay, There’s the Rub....”*

- Outreach organization budgets are getting tighter and tighter
- Coordination of outreach for soft money grants requires funding
 - Estimate 5-10% of the research budget**

*William Shakespeare: *Whether 'tis nobler in the mindperchance to dream: ay, there 's the rub.* The use of "rub" in this and similar passages refers to a friction or impediment to smooth going.

http://www.phrases.org.uk/bulletin_board/27/messages/342.html

**www.tos.org/epo_guide

Why Is It Worth It?

- The funders want it...
- Together, we can improve science literacy and environmental responsibility by
 - Developing meaningful, results-oriented outreach and education to help communities better manage environmental resources

Successful Partnerships that Work

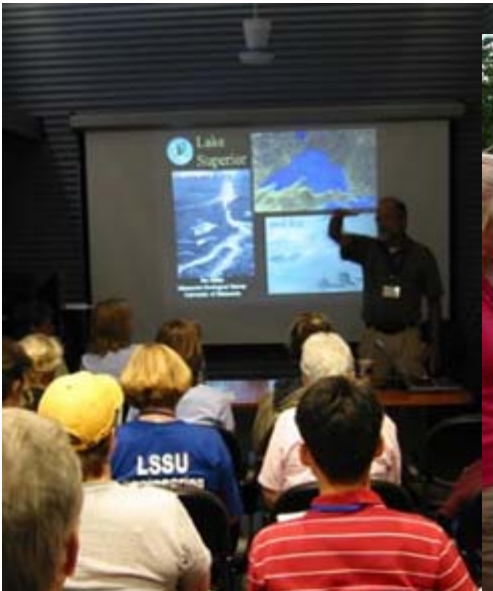
- COSEE Great Lakes
- Lake Superior Streams and the Regional Stormwater Protection Team

Lake Superior Exploration Workshop

Sun	<ul style="list-style-type: none"> • Geology • Ojibwe history 	<ul style="list-style-type: none"> • Geologist • Archaeologist
Mon	<ul style="list-style-type: none"> • Watershed impacts 	<ul style="list-style-type: none"> • Stream ecologist • GIS specialist
Tue	<ul style="list-style-type: none"> • Lake Superior limnology 	<ul style="list-style-type: none"> • Limnologist • Zooplankton ecologist • Fisheries biologist
Wed	<ul style="list-style-type: none"> • Coastal wetlands 	<ul style="list-style-type: none"> • Fisheries biologist • Wetland ecologist
Thu	<ul style="list-style-type: none"> • Climate change • Shipping and invasives 	<ul style="list-style-type: none"> • Landscape ecologist • Biologist
Fri	<ul style="list-style-type: none"> • Teacher presentations 	

Lake Superior Exploration

- Most highly rated aspects:
 1. Presentations by **scientists**
 2. Interaction with colleagues
 3. Field activities with **scientists**
 4. Discussion time with **scientists**



Lake Superior Streams





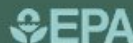
lake superior
duluth streams.org

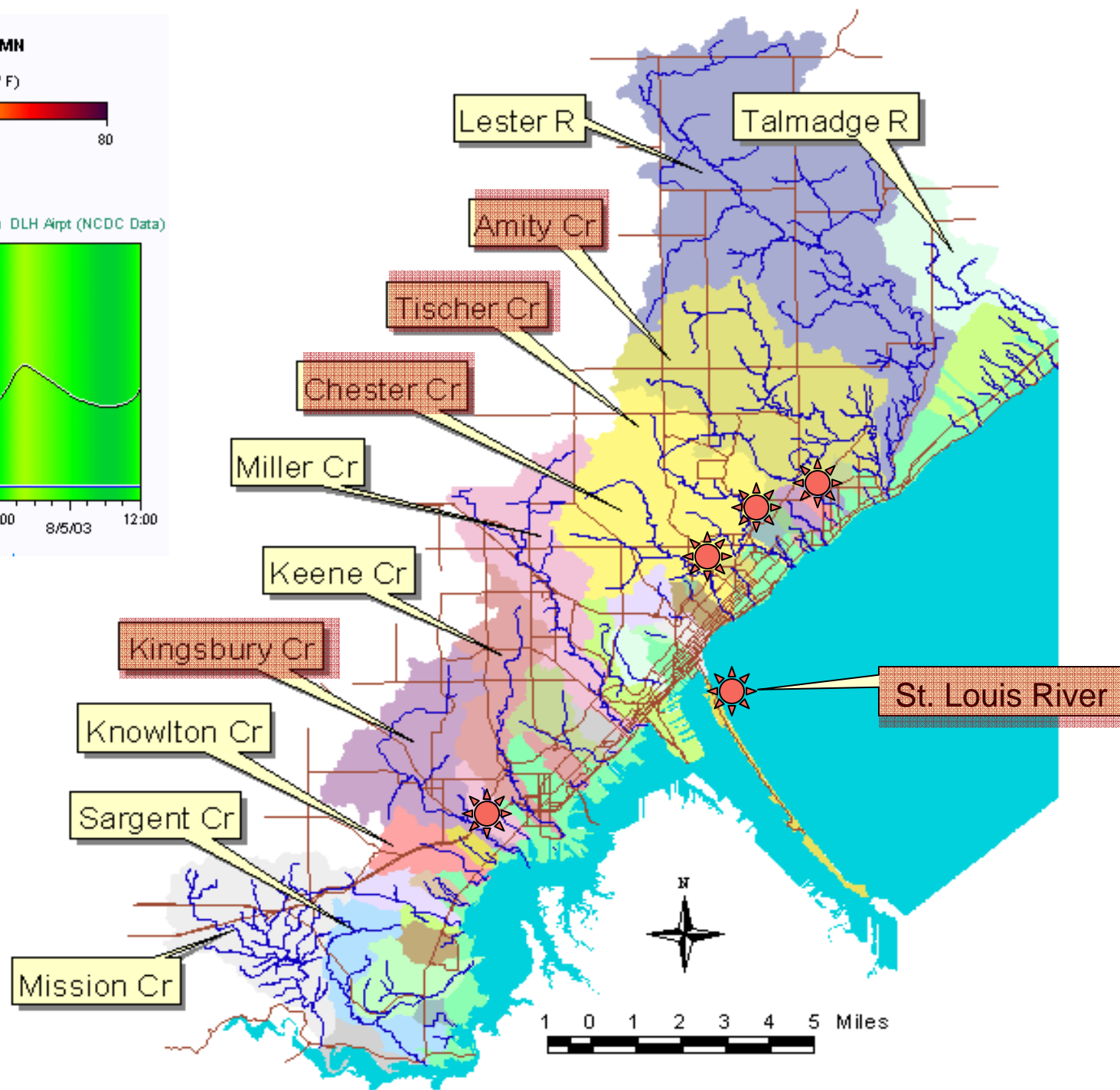
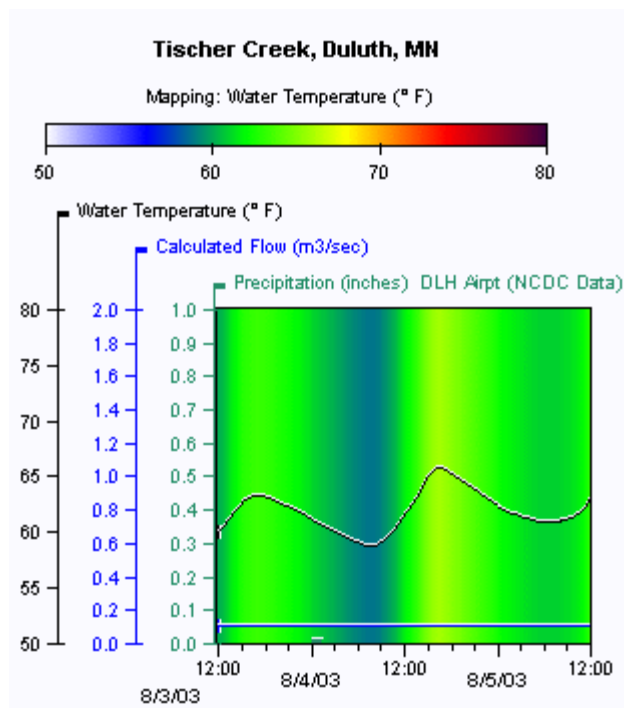


[HOME](#) [ABOUT US](#) [CONTACT US](#) [DATA VIEWER](#) [SEARCH](#) [GLOSSARY](#) [SITE MAP](#) [DATA INDEX](#) [WHAT'S NEW](#)

site updated: 8/15/05

funded by:





A Focal Point

lake superior duluth streams.org

lake superior communities
the streams
citizens and schools
stormwater

understanding

Watersheds Water Quality Primer Water Quality Impacts Organisms Water and Wastewater Landscapes

WATER QUALITY IMPACTS

Bacteria
Frogon
Impervious surface
Lawn care
Motor oil
Pet waste
Road salt
More road salt
Temperature
Litter

Follow a storm through Tischer Creek.
Over 12,000 pounds of habitat smothering, gill fouling mud came past our sensor in just a few hours from this storm....

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lake superior communities
the streams
citizens and schools
stormwater

Volunteer Activities School Resources Home and Garden FAQs Resources

LOCAL SCHOOL STEWARDSHIP

Watershed School Stewardship
Curriculum
Stream Calculators
Resources
Environmental Goals
Landscaping & Landscaping
Curriculum Links

Learning about water
Classroom curricula and other resources
An awareness of watershed processes can begin at an early age. This curriculum links to the left will assist you in preparing lessons for pre-school through high school aged students.
Find out what other local schools are doing using the local school stewardship links.
Don't forget to explore all of the great information presented on this website. Why not start by sending your student on a scavenger hunt of the website?
Scavenger Hunt worksheet
Scavenger Hunt answers



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lake superior communities
the streams
citizens and schools
stormwater

understanding

Regional Information Duluth Stormwater Proctor University of Minnesota, Duluth

Explore the Lake Superior Region
Lake Superior Regional Resources
<http://www.lake-superior.org>

Stormwater and Wastewater Information

Regional Stormwater Information

Superior, WI

Learn more about what is happening in this photo of Lake Superior.

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stormwater

Volunteer Activities School Resources Home and Garden FAQs Resources

TISCHER CREEK

Watershed Map
Stream Data
- Stream Name
- Stream Length
- Stream Elevation
- Stream Flow
- Stream Velocity
- Stream Discharge

Allen called
Cannon Creek.

See designated local stream from left. Most of the stream is in the watershed. Correct factors according to the stream's location in Lake Superior.

lake superior duluth streams.org

about the project...

lake superior communities

- Regional Information
 - Duluth
 - Hermantown
 - Proctor
 - Superior, WI
 - UMD and more....
- stormwater**
 - Stormwater Plan
 - Inflow & Infiltration
 - RSPT
 - Site Design Toolkit

citizens and schools

- Volunteer Activities
- School Resources
- Home and Garden
- Frequently Asked Questions

the streams

- The Streams
- About Data
- Current Data
- Weber Restoration
- QA/QC and more....

understanding

- Stream Primer
- Water Quality Primer
- Water Quality Impacts
- Organisms
- The Landscape
- Water and Wastewater

Real Time Data
Animated graphing tools bring data to life. [Click here.](#)

How about some Summer Fun!
Get outside to learn and recreate in the local streams. [Learn more here!](#)

Visit the MN Beaches website
to find out the water quality status of your favorite North Shore beach. Worried about bacteria in the water? [Click here.](#)

HOME ABOUT US CONTACT US DATA VIEWER SEARCH GLOSSARY SITE MAP DATA INDEX WHAT'S NEW



site updated: 8/15/05

funded by: EPA



Regional Stormwater Protection Team

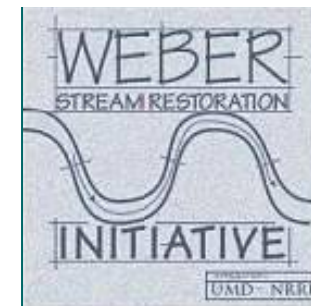
- Coordinated educational programs, fund raising, and technical assistance

UNIVERSITY OF MINNESOTA DULUTH



Bringing It All Together

- Linking research and monitoring to understanding to action



DON'TS for spring raking



running water transports sand, salt and leaves to Duluth streams



DON'T rake yard waste onto the street. Your spring lawn and driveway litter is mostly pieces of dead leaves, sand and soil, the worst stuff to get into our streams. So please don't pile it in the curb or in the street like this fellow.

DOs for spring raking



DO collect yard waste for proper disposal



DO bag leaves and bring them to the WLSSD yard composting site



DO compost leaves in a compost bin or in a wooded area of your yard

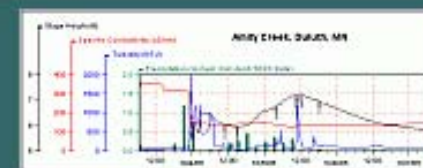
Case Study: City of Superior Rain Gardens



City of Superior
Wastewater Treatment Division
51 East First Street
Superior, WI 54880

The Issues:

- Stormwater runoff
- Erosion from roof runoff



Now collecting "real-time" data from Amity Creek every 15 minutes for depth, flow, temperature, turbidity, and conductivity.



Lester-Amity Maps & GIS Tools

THE SECOND LAKE SUPERIOR
WATERSHED FESTIVAL
ZAAGIDAWAA - "FLOW INTO THE LAKE"

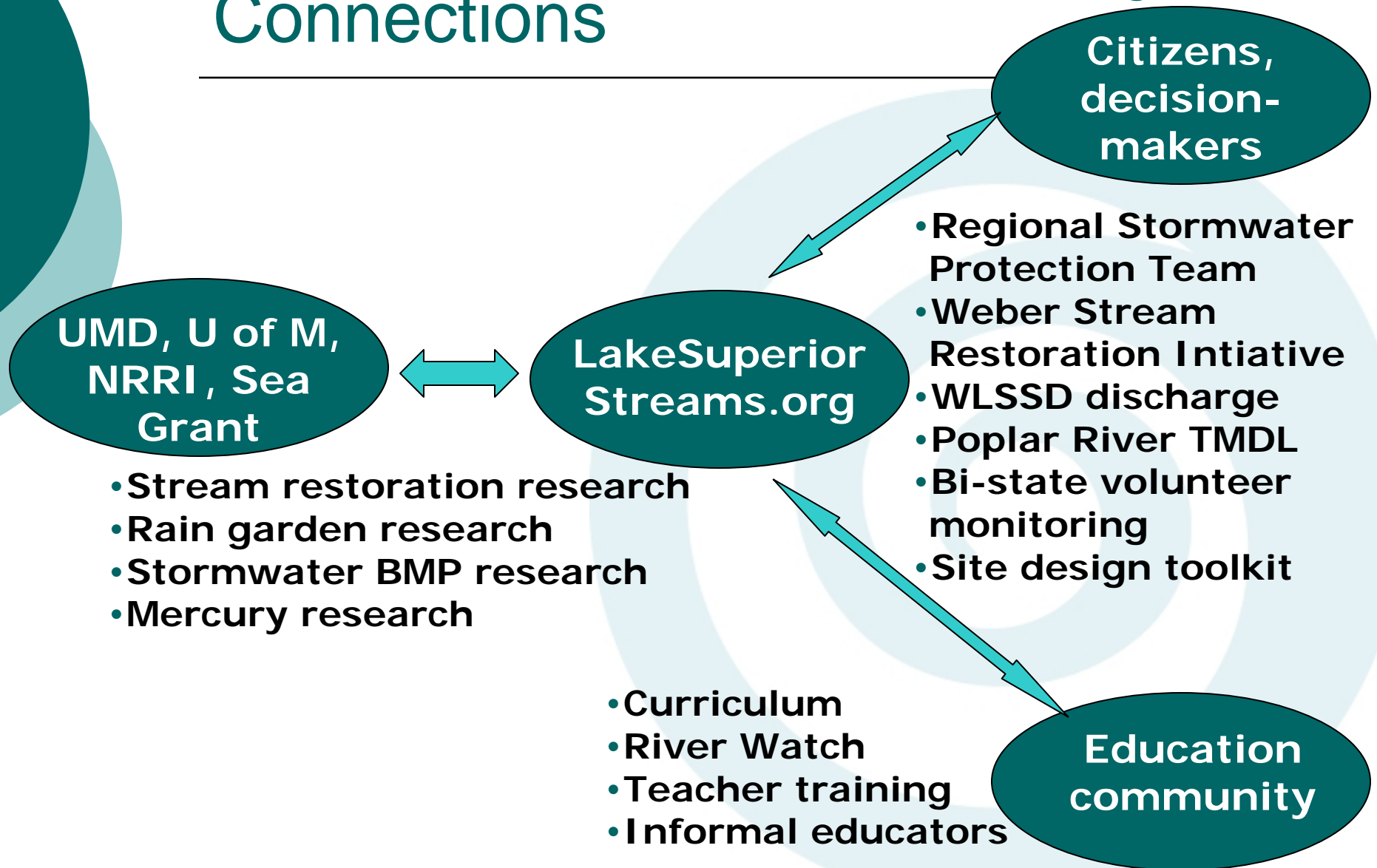
**Saturday
June 2nd**

10 am - 3 pm

Miller Hill Kmart Parking
Lot
Mall Drive, Duluth

Connections

- Community leaders
- State and local agencies
- Stormwater managers



Practical Advice.....*

- Consult your funder/program officer for guidance!
- Get real! You can't do it all. Focus.
- Link up! Partnerships are key.
 - We can help!
- Listen!
 - Respect for our professionalism will help you achieve your goals.

* Broader Impact: Guidance for Scientists about Education and Public Outreach.
EOS 86(12). 22 March 2005

Resources

- COSEE Great Lakes
<http://coseegreatlakes.net>
- Lake Superior Streams
www.lakesuperiorstreams.org
- Education and Public Outreach – A Guide for Scientists
www.tos.org/epo_guide